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THE COMORBIDITY TUBERCULOSIS AND DIABETES MELLITUS A COMORBIDADE TUBERCULOSE E DIABETES MELLITUS LA COMORBILIDAD TUBERCULOSIS Y LA DIABETES MELLITUS

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ABSTRACT

Objective: investigating the characteristics of tuberculosis patients who had as aggravation associated with diabetes mellitus and the effect of comorbidity in the closing situation (cure, abandonment, relapse and death). **Method:** an epidemiological study, transversal, with a quantitative approach, accomplished with tuberculosis patients who had as associated aggravation diabetes mellitus. Data were analyzed by calculating absolute and relative frequencies and indicators of the National Program for Tuberculosis Control. The research project was approved by the Research Ethics Committee, CAEE: 30840614.4.0000.5187. **Results:** the frequency of diabetes mellitus in patients with tuberculosis was of 61 (3,8%) cases. There was a male predominance (85%), aged between 40-59 years old (75%) and with no schooling (35%). 70% showed less adverse reactions to TB drugs. 100% of the patients achieved the cure. **Conclusion:** there was a significant incidence of association between the diseases in the city. The socio-clinical and epidemiological knowledge of this comorbidity is of great relevance to public health, because it generates benefits and effective strategies to control both diseases. **Descriptors:** Comorbidity; Diabetes Mellitus; Treatment; Tuberculosis.

RESUMO

Objetivo: investigar as características de doentes com tuberculose que possuíam como agravo associado o diabetes mellitus e o efeito da comorbidade na situação de encerramento (cura, abandono, recidiva e óbito). **Método:** estudo epidemiológico, transversal, com abordagem quantitativa, realizado com doentes de tuberculose que possuíam como agravo associado o diabetes mellitus. Os dados foram analisados pelo cálculo de frequências absolutas e relativas, e indicadores do Programa Nacional de Controle da Tuberculose. O projeto de pesquisa foi aprovado pelo Comitê de Ética em Pesquisa, CAEE: 30840614.4.0000.5187. **Resultados:** a frequência do diabetes mellitus em doentes com tuberculose foi de 61 (3,8%) casos. Houve predomínio de sexo masculino (85%), faixa etária entre 40-59 anos (75%) e sem escolaridade (35%). 70% apresentaram reações adversas menores aos tuberculostáticos. 100% dos casos alcançaram a cura. Conclusão: verificou-se incidência significativa da associação entre as doenças no município. O conhecimento sócio-clínico-epidemiológico desta comorbidade é de grande relevância para a saúde pública, pois gera subsídios e estratégias efetivas para controle de ambas as enfermidades. **Descritores:** Comorbidade; Diabetes Mellitus; Tratamento; Tuberculose.

RESUMEN

Objetivo: investigar las características de los pacientes con tuberculosis que tenían como agravamiento asociado con la diabetes mellitus y el efecto de la comorbilidad en la situación de cierre (curación, el abandono, la recaída y muerte). **Método:** un estudio epidemiológico, transversal, con enfoque cuantitativo, realizado con pacientes con tuberculosis que tenían como la diabetes mellitus asociada agravación. Los datos se analizaron mediante el cálculo de frecuencias absolutas y relativas, y los indicadores del Programa Nacional para el Control de la Tuberculosis. El proyecto de investigación fue aprobado por el Comité de Ética en la Investigación, CAEE: 30840614.4.0000.5187. **Resultados:** la frecuencia de la diabetes mellitus en pacientes con tuberculosis fue de 61 (3,8%) casos. Hubo un predominio masculino (85%), con edades comprendidas entre 40-59 años (75%) y sin escolaridad (35%). 70% tuvo reacciones adversas de menor importancia a los medicamentos antituberculosos. 100% de los pacientes logró una cura. **Conclusión:** hubo asociación significativa entre la incidencia de enfermedades en la ciudad. El conocimiento socio-clínico y epidemiológico de esta comorbilidad es de gran relevancia para la salud pública, ya que genera beneficios y estrategias eficaces para el control de ambas enfermedades. **Descriptores:** Comorbilidad; Diabetes Mellitus; Tratamiento; Tuberculosis.

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INTRODUCTION

Tuberculosis (TB) is an infectious disease transmitted by air whose causative biological agent is the *Mycobacterium tuberculosis*, also called Koch bacillus.¹ Despite being potentially preventable and curable, it is still considered in developing countries as a major public health problem due to difficulties in controlling and combating the same.²

Tuberculosis is still considered one of the seven priority diseases at the Brazilian Ministry of Health, integrating as neglected disease due to its higher prevalence in areas of great poverty and social inequality, as well as in populations with low educational level.²

In 2013, the World Health Organization (WHO) found an estimated 9,0 million new cases of TB worldwide, with Brazil being one of the 22 countries responsible for 80% of the global burden, occupying the 16th place. In the same year it was reported almost 91.826 new cases in the country, corresponding to an incidence of 48/100.000 inhabitants. Also in 2013, 1.458 cases were reported in the state of Paraíba (PB) of these 121 cases were confirmed in the city of Campina Grande, where 91 were of the pulmonary form, followed by 27 the way extrapulmonary and 3 of miliary.

Some factors related to the impairment of the immune system may contribute to increase in the number of TB cases, among which is diabetes mellitus (DM)^{2,3,4}, given that the DM triples the risk for the individual develops it. Thus, the global increase in the prevalence of diabetes has influenced the increased incidence of TB in several regions, potentially causing serious implications for TB Control.^{3,5}

Patients with diabetes mellitus are more likely to develop TB due to impairment of the immune system, with predominance in these cases atypical pulmonary tuberculosis with involvement of the lower lobes of the lung, as well as cavitations, clinical signs suggestive of pneumonia or cancer because of an accelerated deterioration process of bacillary lesions. As the location of these bacilli, the diagnosis of TB is usually delayed, causing minor positivity in sputum smear, sputum culture and differential diagnosis for other suspected diseases.^{6,7}

Individuals with DM who go on to develop TB have gravity on the clinical picture much faster and meaningful than those without diabetes, and should be taken more cautious measures in the care of them, and the need for rapid diagnosis of DM in patients with TB in order to target specific assistance of the

The comorbidity tuberculosis and diabetes mellitus.

case.⁸ In this way, the study of the relationship of TB/DM in developing countries is an attempt to avoid certain complications that arise as a result of the association between the two diseases, thus contributing to the control of these diseases.^{9,10}

Although do not yet exist policies that make an integration between these two diseases, the National Program for Tuberculosis Control in Brazil (NTP) points as a priority research expansion in the TB area in association with DM^{2,9}, so this study is justified in trying to contribute to the search for answers about the influence that the DM exercises in tuberculosis control from the perspective of providing subsidies to health professionals as well as nursing, to ensure better understanding of the association of these diseases through information obtained.

OBJECTIVE

- Investigating the socioeconomic, clinical and epidemiological characteristics of patients with tuberculosis who had as grievance associated DM; and the effect of comorbidity in the closing situation (cure, abandonment, relapse, death).

METHOD

This is an epidemiological study, of cross-sectional design and with a quantitative approach. The study population comprised 1984 TB patients in all ways, who had as injury associated with DM, reported in the Tuberculosis Control Program of the Municipality of Campina Grande; diagnosed from July 2001 to July 2013.

For data collection there was used a semi-structured instrument containing primary and secondary data. To obtain the primary data there were interviewed TB and DM patients. For secondary data there was used the Diseases Information System and Notifications (SINAN) of the Municipal Health Department of Campina Grande/PB and the medical record of the patient.

Data analysis comprised descriptive results through absolute and relative frequencies, and obtaining the NTP monitoring indicators. For this it was necessary the storage of the data collected in a spreadsheet of Microsoft Office Excel 2010, which was latter transferred to the Statistical Package for the Social Sciences (Software SPSS) version (20.0).

The research project was approved by the Research Ethics Committee of the State University of Paraíba/UEPB, CAEE 30840614.4.0000.5187; meeting the guidelines of resolution 466/12 of the National Health

Lacerda SNB, Silva TC da, Araújo PPC de.

Council (CNS), which provides the rules that regulate researches with humans in Brazil.

RESULTS

In the period from 2001 to 2013 there were notified 1984 TB cases in the municipality of Campina Grande - PB. When investigating the frequency of DM in TB, there were obtained 61 (3,8%) cases, the incidence of this comorbidity was of 38 for every 1.000 inhabitants. After the inclusion and exclusion criteria, there was obtained a sample of 23 cases with 13 deaths during the study period, 02 diagnostic changes of TB, 03 changes of

The comorbidity tuberculosis and diabetes mellitus.

address, 19 incomplete/non-existent addresses and 01 impaired comprehension. Of these respondents, 03 refused to participate totaling 20 interviews.

In analyzing the demographic profile of TB cases and DM, as shown in Table 1, it was found that there was a predominance of males (85%), dark colored (60%) and aged between 40-59 years old (75%). It is observed that the education level is low (35% with no education and 30% have not finished elementary school). Regarding the income, 65% of interviewees reported receiving up to 1 minimum wage.

Table 1. Socio-demographic profile of TB and DM cases. Campina Grande/PB, 2001-2013.

Variables	n	%
Gender		
Male	17	85
Female	03	15
Race		
White	03	15
Black	04	20
Dark	12	60
Yellow	01	05
Age (in years)		
40-59	15	75
60 and over	05	25
Schooling		
Without schooling	07	35
Incomplete Elementary School	06	30
Complete Elementary School	03	15
Incomplete High School	01	05
Complete High School	01	05
Incomplete Higher Education	01	05
Complete Higher Education	01	05
Income		
Up to 1 minimum wage	13	65
More than 1 and < 3 minimum wages	06	30
Does not apply	01	05

With regard to illness and treatment of TB in diabetics, it was found that (Table 2) in 75% of cases of TB had diagnostic confirmation of DM. After the demand for health services by symptoms of TB the time taken to obtain the diagnosis mostly (50%) was less than or equal two weeks ago. The TB Reference Ambulatory diagnosed 95% of cases, and 75% of these followed during the treatment. There was prevalence of new cases (80%) and lung clinical type (75%).

Regarding the type of DM, 40% of the cases were type II and 40% were blank in the chart. With regard to other comorbidities, 60% of respondents did not, and 25% were hypertensive.

The most widely used drugs for TB control were rifampin, isoniazid, pyrazinamide and

ethambutol (basic scheme of treatment) in 55% of cases and 25% of cases used (rifampicin, isoniazid, pyrazinamide) that also corresponded to the basic scheme before introduction ethambutol in 2009. Approximately 30% of diabetics used NPH insulin for the treatment of diabetes, in this period. With regard to minor adverse effects, 70% had reactions to TB drugs during treatment.

Regarding the treatment of TB, 55% of cases performed in six (6) months, and all had 100% of cure.

Table 2. Clinical and epidemiological information about the illness/treatment of tuberculosis in patients with diabetes mellitus. Campina Grande/PB, 2001-2013.

Variables	N	%
Diagnosis of TB after diagnosis of DM		
Yes	15	75
No	04	20
NS/NR	01	05
Type of the unit which diagnosed the case		
Clinic of Reference in TB	19	95
Hospital	01	05
TB entry type		
New Cases	16	80
Not found*	04	20
Clinical form of TB		
Lung	15	75
Extra-pulmonary (Pleural)	01	05
Not found	04	20
Type of DM		
Type II	08	40
Blank	08	40
Not found	04	20
Other comorbidities		
Hypertension	05	25
Hypertension and heart diseases	01	05
Hypertension, obesity and other	01	05
Other	01	05
Do not have	12	60
Medicines for the treatment of TB		
Rifampin, Isoniazid and Pyrazinamide	05	25
Rifampin, Isoniazid, Pyrazinamide and Ethambutol	11	55
Not found	04	20
Drug reactions during treatment of TB		
Yes	14	70
No	06	30
Medicines for the treatment of diabetes mellitus		
Regular Insulin	03	15
NPH	06	30
Regular insulin/NPH	01	05
Regular insulin and Glyburide	02	10
Regular insulin, Glyburide and Metformin	01	05
Regular insulin and Metformin	01	05
NPH insulin and Metformin	01	05
Blank	01	05
Not found	04	20
Duration of treatment of TB		
6 months	11	55
>6 <9 months	02	10
≥9 <12 months	02	10
≥12 months	01	04
Not found	04	20
Situation of closure of TB		
Cure	20	100

*Referring to four (4) medical records not found in health service. NS = not know. NR = not respond.

DISCUSSION

By analyzing the socio-demographic profile, cases of TB and DM obtained as predominantly males, a result also found in studies conducted in the State of Minas Gerais.^{11,12} This higher concentration may be related to socioeconomic and cultural factors that designate man as a member responsible for family income, exposing him to greater risk situations (trades, populated places), as to illness. The incompatibility of working hours with the functioning of health services is common in this audience, which contributes to late diagnosis, and treatment failure, with more likely to abandon treatment and death from TB.^{12,13,14}

Regarding race, the profile of individuals with the association TB/DM was characterized by predominance brown, common attribute connected to the Brazilian population that has generally this feature, this data was also found in a study conducted in a city in the North, in which 76,7% of patients were brown, although it has not yet determined how the race is related to the occurrence of the disease.¹⁵

A higher concentration of cases of TB and DM aged 40 to 59 years old was found, obtaining similar results to other researches.^{12,16,17} Studies said that the incidence in this age group would be coinciding with the illness DM.^{18,19} Although TB is common in young adults, the study could identify that the elderly population continues to be the most affected by DM and the age a risk factor for patients with both diseases.¹¹

In Brazil, the incidence of TB among the elderly has grown. The reason for this increased incidence is due to the progressive depletion of the immune system, and immunosuppression characteristic of the age, it is believed that changes in lung function and mucociliary clearance may also favor a reactivation of Koch's bacillus in old age. It is also assumed that the various associated immunosuppressive conditions like diabetes and other co-morbidities may also contribute to the development of tuberculosis lesions.²⁰

The low level of education found in this population brings an important risk factor for the illness, as well as non adherence, influencing negatively in controlling both diseases.^{13,21} This is because the patient does not understand the severity of the disease, making it difficult to promote health. For this, one must have an adequate communication of health professionals to a better understanding of patients about the severity of the disease, noting that the lower the education of

The comorbidity tuberculosis and diabetes mellitus.

patients, the greater the need for dialogue between health professionals and patients.¹³

It can be observed that most survey respondents said receiving up to a minimum wage, a fact found in a study which shows that the social and economic conditions strongly influence the treatment options for both diseases. Tuberculosis, poverty and difficult access to health services showed strong connection that is a worrying fact, especially when TB is associated with DM, even though studies have shown the association of TB and DM a common episode in both the developing, as developed in countries.¹⁰

Because of low wages, many patients end up opting for self treatment modality administered, ie prefer ingesting the TB medication in own home without proper supervision, not contributing to treatment adherence.^{4,22} Therefore, it is necessary the help of trained professionals to carry out proper monitoring of these patients, thus realizing the TDO (Directly Observed Treatment), a practice that is intended to help such patients throughout the treatment of the disease, and is the mode that MOH recommends offering support, supervision of drug doses, clarifying doubts and emphasizing the importance of conducting any treatment to obtain cure.

Regarding disease and treatment of tuberculosis in diabetic patients, there was prevalence in TB cases with diagnostic confirmation of DM. Such confirmation is due to the fact that the incidence of TB is found more frequently in individuals with abnormal immunological system.^{3,23,24} In care proposal and integrated control of TB and DM developed by the International Union Against Tuberculosis and Lung Disease (UNION) and the World Health Organization is recommended to ask patients with DM about the presence of cough in the last two weeks at diagnosis of DM, as well as the monitoring of calls, where the presence of symptoms should be evaluated the presence TB. This varies according to the guidelines of each country, as well as TB patients should be screened for DM at the beginning of their treatment.³

Regarding the type of unit that diagnosed the case of TB, there was predominance of Reference Clinic for TB. This fact can be justified due to the recommendations of the National Programme to Fight Tuberculosis (NTCP) in which the following reference services the care and monitoring of the most complex cases and comorbidities. Although it is a unit within easy reach, there are cases where the diagnosis is made in hospital

Lacerda SNB, Silva TC da, Araújo PPC de.

network.²⁵ When the diagnosis is made in the hospital network, patients after discharge start to be accompanied by the reference service until being discharged by healing.

In this study the majority of patients who began treatment were new cases. Thus we see the importance of investments aimed at providing control activities in order to minimize the transmissibility of the disease. The pulmonary form was predominant in the findings of this study. To exercise great influence on the magnitude and significance of TB, and to be the main form of transmission of the disease to the community, requires special attention not only to decrease the incidence, but to reduce latent infections through the transmission chain.^{17,24}

People with DM tend to develop three times more the TB. A family history of type II DM is presented as one of the conditions of risk for developing the disease, corroborating our findings, although for this variable there was found a high percentage of information that has not been met.¹⁵

During data collection on records of TB Reference Clinic could not find another type of DM due to incompatibility of the chips. It is of utmost importance to recognize the instructions for fulfilling the Tuberculosis Notification Form by health professionals of the reporting units, and the creation of new strategies as a means of awareness in an attempt to ensure proper completion of the chips.

Regarding the other comorbidities, the vast majority of respondents did not present other associated disease, accounting for only 25% of cases of hypertension associated with the disease.

Concerning the most widely used drugs for TB, the scheme used was the basic treatment (rifampicin, isoniazid, pyrazinamide and ethambutol). It should be noted that these drugs are freely available by the MOH and its intake should be accomplished through the Directly Observed Treatment (DOT), a practice which aims to oversee drug doses from the start of treatment until the discharge after cure, and as aid from a health professional or trained person. Supervision should be done daily or at least three times a week.⁴

In the variable adverse reaction, the vast majority of patients reported having some discomfort during treatment. Therefore, it is extremely important to observe the dosage of medicines, the treatment time and the emergence or worsening of adverse effects as a way to reduce the discomfort in the

The comorbidity tuberculosis and diabetes mellitus.

patient.²⁶ Patients with minor adverse reactions (malaise, nausea, epigastric pain, itching) should continue treatment with TB drugs and make use of medicines for symptom relief, without the need of discontinuing treatment, since those with major adverse effects (gastrointestinal intolerance, liver toxicity, hemolytic anemia, convulsions) responsible drug should be stopped and restarted when possible.²⁶ Due to these many factors, many patients abandon treatment because of the large amount of administered drugs when used in combination with other diseases and the strong adverse reactions.

The NPH insulin is the most widely used for the treatment of diabetes. Study to analyze the impact of DM in the form of presentation of TB in patients hospitalized noted that 99 patients (80,5%) had a previous diagnosis at admission and 24 (19,5%) had diagnosis of DM during hospitalization. Of these 99 patients, 74 underwent the treatment with oral hypoglycemic agents and insulin 25.¹¹ During hospitalization 78 patients (63,4%) were treated with insulin, 41 (33,3%) with oral hypoglycemic agents and 4 (3,3%) by diet alone.

The patients studied did treatment (6) months, minimum time for completion of therapy. If the initial clinical outcome has not been satisfactory, such as the appearance of a few bacilli in the sixth month, the treatment may be extended. The Recommendations Manual for tuberculosis control in Brazil reports that the duration of treatment should be reported to the patient, thus contributing to the therapeutic success.²²

Regarding the situation of closure of cases of TB in patients with DM, it appears that the cure rate is in accordance with the pre-established goal by WHO/MOH, which aims to detect 70% of cases and cure at least 85% of patients. Although patients with TB have submitted DM as comorbidity, all achieved 100% cure even with low education. Thus, it was observed that in the face of numerous factors that should have favored the abandonment of treatment, there was a favorable percentage of cure, ie, it can be said that educational activities in the care and guidance to patients regarding the importance of therapy, secured one effectiveness of health services in TB care and control of DM.

Although the study has obtained a satisfactory outcome of healing among those interviewed patients, the research had some limitations on the entire collection process, such as difficult access to patients because of changes in home address, unsuitable timetables to meet them the residence and

Lacerda SNB, Silva TC da, Araújo PPC de.

divergence in results when compared to other studies.

CONCLUSION

The characteristics of patients with TB who had DM as a comorbidity behaves similarly to other studies that aimed to study the profile of the individuals affected by TB, with the predominance of males, mixed race, poorly educated and maximum income of one minimum wage, except for the age group, which can be elucidated by the most sickening of DM in individuals older than 40.

Recognizing TB and DM as comorbidity allows identifying the factors that predispose individuals' susceptibility to illness and the implications for disease control, allowing professionals and healthcare managers to implement effective measures for the integrated management of this comorbidity. Thus, knowledge about this dual epidemic is essential, since the same negative leverage the achievement of global targets for TB control and DM.

Nursing is an integral part of every care to these patients which has contributed generally to treatment and recovery thereof, aiming control measures and solving problems. Overall, this study tends to provide a better understanding to health professionals about tuberculosis and diabetes mellitus directing these patients to a better care.

It is hoped that this study may contribute to awaken the health professionals a fresh look at the relationship between these two diseases so that the active search be a constant practice, giving priority to the treatment and health of these patients seeking educational measures to combat TB and control of DM.

REFERENCES

1. Ministério da Saúde (Brasil), Agência Fiocruz de notícias. Tuberculose. Ministério da Saúde [Internet]. 2013 [cited 2014 Oct 10]. Available from: <http://www.agencia.fiocruz.br/tuberculose>
2. Velloso L, Neto PPA. Diabetes na prática clínica. Diagnóstico, epidemiologia e fisiopatologia do diabetes: fisiologia e fisiopatologia das células beta, implicações clínicas e terapêuticas [Internet]. 2008 [cited 2014 Oct 10]. Available from: <http://www.diabetesebook.org.br/modulo1>
3. Union/International Against tuberculosis and lung disease. Epidemiology and interaction of diabetes mellitus and tuberculosis and challenges for care: a review. Public Health Action [Internet]. 2013 [cited

The comorbidity tuberculosis and diabetes mellitus.

- 2014 Oct 10];3(1):3-9. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4463136/>
4. Brasil. Ministério da Saúde. Cadernos de Atenção Básica: estratégias para o cuidado da pessoa com doença crônica. Brasília; 2014.
5. Seiscento M. Tuberculose em Situações Especiais: HIV, diabetes mellitus e Insuficiência Renal, Pulmão RJ. [Internet]. 2012 [cited 2014 Oct 10];21(1):23-6. Available from: http://www.sopterj.com.br/profissionais/_revista/2012/n_01/06.pdf.
6. Rodrigues ILA, Monteiro LL, Pacheco RHB, Silva SED. Abandono do tratamento de tuberculose em co-infectados TB/HIV. Rev Esc Enferm USP [Internet]. 2010 [cited 2014 Oct 10];44(2):383-7. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0080-62342010000200020.
7. Sasaki CM, Scatena LM, Gonzales RIC, Netto AR, Hino P, Villa TCS. Predictors of favorable results in pulmonary tuberculosis treatment (Recife, Pernambuco, Brazil, 2001-2004). Rev Esc Enferm USP [Internet]. 2008 [cited 2014 Oct 10];44(2):504-10. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0080-62342010000200037.
8. Miranda SS. Tratamento da Tuberculose em Situações Especiais, Pulmão RJ [Internet]. 2012 [cited 2014 Oct 10];21(1):68-71. Available from: http://www.sopterj.com.br/profissionais/_revista/2012/n_01/16.pdf.
9. Perrechi MCT, Ribeiro SA. Desfechos de tratamento de tuberculose em pacientes hospitalizados e não hospitalizados no município de São Paulo. Rev bras epidemiol [Internet]. 2011 [cited 2014 Oct 10];37(6):783-90. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1806-37132011000600012.
10. Coelho DMM, Viana RL, Madeira CA, Ferreira LOC, Campelo V. Perfil epidemiológico da tuberculose no Município de Teresina-PI, no período de 1999 a 2005. Epidemiol serv saúde [Internet]. 2010 [cited 2014 Oct 10];19(1):33-42. Available from: <http://scielo.iec.pa.gov.br/pdf/ess/v19n1/v19n1a05.pdf>.
11. Ruslami R, Aarnoutse RE, Alisjahbana B, Ven AJ, Crevel R. Implications of the global increase of diabetes for tuberculosis control and patient care. Trop Med Int Health [Internet]. 2010 [cited 2014 Oct 10];15(9):1289-99. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20955495>

Lacerda SNB, Silva TC da, Araújo PPC de.

The comorbidity tuberculosis and diabetes mellitus.

12. Carreira SD. Impacto da diabetes na forma de apresentação da tuberculose em doentes hospitalizados. *Rev port pneumol* [Internet]. 2012 [cited 2014 Oct 10];18(5):239-43. Available from: <http://www.redalyc.org/articulo.oa?id=169724490008>.
13. Bowkalowski C, Bertolozzi MR. Vulnerabilidades em pacientes com tuberculose no distrito sanitário de Santa Felicidade - Curitiba, PR. *Cogitare enferm* [Internet]. 2010 [cited 2014 Oct 10];15(1):92-9. Available from: <http://ojs.c3sl.ufpr.br/ojs/index.php/cogitare/article/download/17178/11313>.
14. Union/International Against Tuberculosis and lung disease/The Union; World Diabetes Foundation/WDF. World Health Organization/WHO Tuberculosis and diabetes mellitus: the growing threat of the double burden of diabetes and tuberculosis [Internet]. 2011 [cited 2014 Oct 10]. Available from: http://www.worlddiabetesfoundation.org/sites/default/files/TB-diabetes%20co-epidemic%20fact%20sheet_March2014%20update.pdf.
15. World Health Organization. Global tuberculosis control: surveillance, planning, financing. Geneva [Internet]. 2013 [cited 2014 Oct 10]. Available from: http://www.who.int/tb/publications/global_report/en/.
16. Peeling L, Wing K, Mathur R, Merino D, Smeeth L, Moore DAJ. Risk of tuberculosis in patients with diabetes: population based cohort study using the UK Clinical Practice Research Datalink. *BMC Med* [Internet]. 2015 [cited 2014 Oct 10];13:135. Available from: <http://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-015-0381-9>.
17. Giroti SKO, Belei RA, Moreno FN, Silva FS. Perfil dos pacientes com tuberculose e os fatores associados ao abandono do tratamento. *Cogitare enferm* [Internet]. 2010 [cited 2014 Oct 10];15(2):271-7. Available from: <http://ojs.c3sl.ufpr.br/ojs/index.php/cogitare/article/download/17860/11653>.
18. Dantas DNA, Enders BC, Queiroz AAR, Coura AS, Silva MPM, Menezes RMP. Fatores associados à primeira escolha de local para o diagnóstico da tuberculose. *Rev gaúcha enferm* [Internet]. 2014 [cited 2014 Oct 10];35(3):75-81. Available from: <http://seer.ufrgs.br/index.php/RevistaGauchaEnfermagem/article/view/44767>.
19. Santos J. Resposta brasileira ao controle da tuberculose. *Rev saúde pública* [Internet].

- 2007 [cited 2014 Oct 10];41(Supl.1):89-94. Available from: <http://www.scielo.br/pdf/rsp/v41s1/6546.pdf>.
20. Hino, P, Cunha TN, Villa TCS, Santos CB. Perfil dos casos novos de tuberculose notificados em Ribeirão Preto (SP) no período de 2000 a 2006. *Cienc cuid saúde* [Internet]. 2011 [cited 2014 Oct 10];16(1):1295-301. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-81232011000700063.
21. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Guia de Vigilância Epidemiológica. Brasília; 2010.
22. Brasil. Ministério da Saúde. Manual de recomendações para o controle da Tuberculose no Brasil. Série A. Normas e Manuais Técnicos. Brasília: Ministério da Saúde; 2011.
23. International Diabetes Federation. Diabetes Atlas, sixth edn [Internet]. Brussels. 2013 [cited 2014 Oct 10]. Available from: https://www.idf.org/sites/default/files/Atlas-poster-2014_EN.pdf.
24. Ottmani SE, Murray MB, Jeon CY, Baker MA, Kapur A, Lonnroth K et al. Consultation meeting on tuberculosis and diabetes mellitus: meeting summary and recommendations. *Int j tuberc lung dis* [Internet]. 2010 [cited 2014 Oct 10];14(12):1513-7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21180207>.
25. Mendes TAB, Goldbaum M, Segri NJ, Barros MBA, Cesar CLG, Carandina L et al. Diabetes mellitus: fatores associados à prevalência em idosos, medidas e práticas de controle e uso dos serviços de saúde em São Paulo, Brasil. *Cad saúde pública* [Internet]. 2011 [cited 2014 Oct 10];27(6):1233-43. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2011000600020.
26. Campani STA, Moreira JS, Tietbohel CN. Fatores preditores para o abandono do tratamento da tuberculose pulmonar preconizado pelo Ministério da Saúde do Brasil na cidade de Porto Alegre (RS). *J bras pneumol* [Internet]. 2011 [cited 2014 Oct 10];37(6):776-82. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1806-37132011000600011.

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